Every child a scientist: student-centred approaches to active learning in science

PERRY, Emily

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Every child a scientist: Student-centred approaches to active learning in science

Dr Emily Perry
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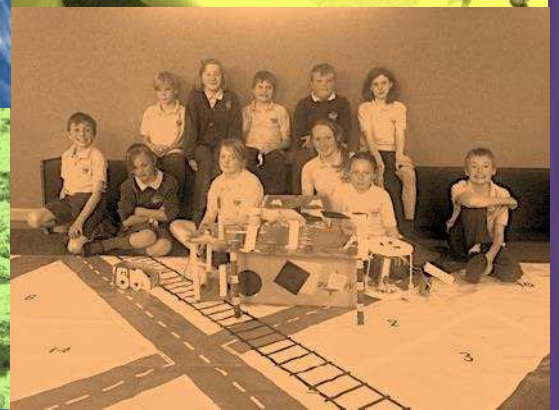
Innovative approaches to learning and teaching



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Innovative approaches to learning and teaching

Our areas of work:

- Teacher professional learning

We develop, facilitate and evaluate CPD programmes for:

- Individual teachers
- Individual schools
- School groups
- Local authorities
- Publishers and employers
- Governments and Ministries of Education

Dr Emily Perry, Sheffield Institute of Education, Sheffield Hallam University

Tuesday 18 Oct 2016 1600 – 1700.
Workshop 6 in Room 4 AA102

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Innovative approaches to learning and teaching

Our areas of work:

- Active and enquiry-based approaches to learning

We develop, with teachers, schools and students, curriculum plans and teaching materials for:

- Individual schools
- School groups
- Publishers
- Museums and charities
- Governments and Ministries

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Innovative approaches to learning and teaching

Our areas of work:

- Widening participation to under-represented groups in STEM subject areas

We ensure access to and engagement with STEM education and STEM careers by working with:

- Students
- Teachers and schools
- Employers
- Publishers
- Museums and charities
- Governments and Ministries

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Innovative approaches to learning and teaching

Our areas of work:

- Collaborative research and evaluation

- We support teachers and schools to engage with research and embed findings in practice.

- We work with funders including charities, ministries and museums to evaluate educational interventions and programmes.

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We work locally, regionally, nationally and internationally

+ projects working across multiple countries in the EU

TESOL centre 30 years - international students & EFL courses for teachers
English for Academic Purposes - engaging effectively with academic conventions and approaches

Iceland
UK
Poland
Czech Republic
Azerbaijan
Hong Kong
Jamaica
UAE
India
Gambia
Thailand
Ghana
Sri Lanka
Malaysia
Brunei
Singapore
South Africa

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Every child a scientist: Student-centred approaches to active learning in science

Workshop objectives

- To explore the benefits of enabling students to act as scientists in their learning
- To illustrate successful projects and teaching strategies which support students to act as scientists
- To share and collaboratively develop further ideas for authentic student research

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Every child a scientist: Student-centred approaches to active learning in science

Students acting as scientists: benefits and challenges

Students are:

- taking the initiative
- stating their own questions
- finding solutions to problems
- collecting and analysing data
- evaluating their findings
- communicating ideas

What are the challenges and benefits of supporting students to learn in these ways?

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What is needed is a value system that appreciates and understands the value of education at a much deeper level and on a much broader scope than merely getting good test scores or sending children to more selective and prestigious schools.

D.Y. DAI et al (2011) Inquiry-Based Learning in China: Do Teachers Practice What They Preach, and Why?

Teachers …can face some difficulties [such as] being not able teach the science content accurately in the inquiry lessons, being not able to guide and help students appropriately in the inquiry-based science lessons and having insufficient knowledge about inquiry.

S. Kapucu (2016) Guided Inquiry-Based Electricity Experiments: Pre-service Elementary Science Teachers' Difficulties

Managing learning activities …requires much more planning, preparation and an ability to respond to different stimuli in the classroom. This can be unacceptable for many teachers, who therefore resort to traditional methods of teaching.

J. Sokda et al (2013) Inquiry-based science education – fashionable trend or hope for science education regeneration?

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Instruction emphasizing active thinking and drawing conclusions from data or providing hands-on experience with scientific phenomena were associated with increased likelihood of scientific understanding.

M.O. Martin, et al (2012) TIMSS 2011 International Results in Science

[Students] enjoyed learning science when they were finding out answers to their own questions.

OFSTED (2013) Maintaining Curiosity

Through a combination of "hands-on" and "minds-on" learning, inquiry engages students in a process through which they learn science content best.

Every Child a Scientist: Achieving Scientific Literacy for All (1998)

The actual doing of science or engineering can pique students' curiosity, capture their interest, and motivate their continued study.

A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas National Academy of Sciences (2011)

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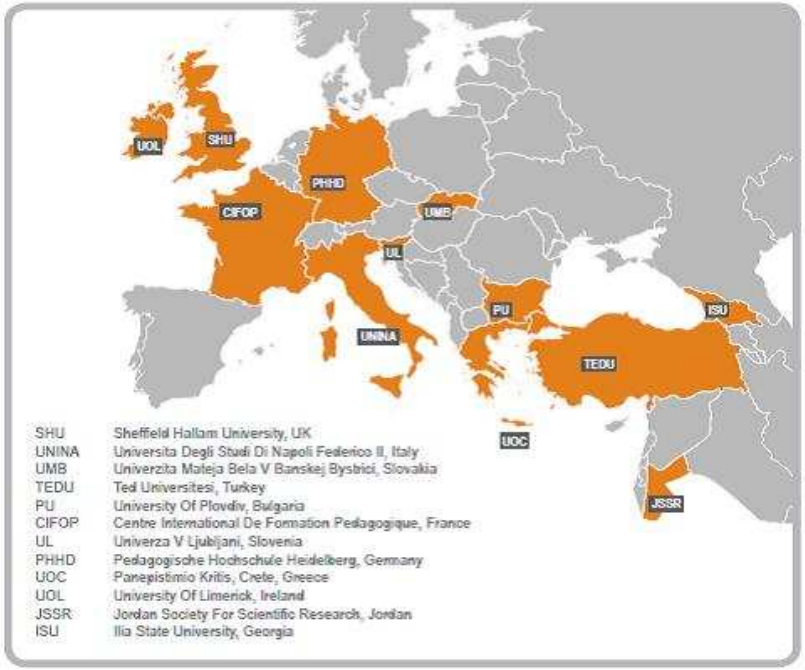
Chain Reaction: a case study



- Funded by the European Union
- 2013 – 2016
- 3.6M Euros
- 12 partner countries
- Students acted as scientists: carrying out real-life research and presenting their findings at conferences.

https://vimeo.com/116847032

http://www.chreact.eu/

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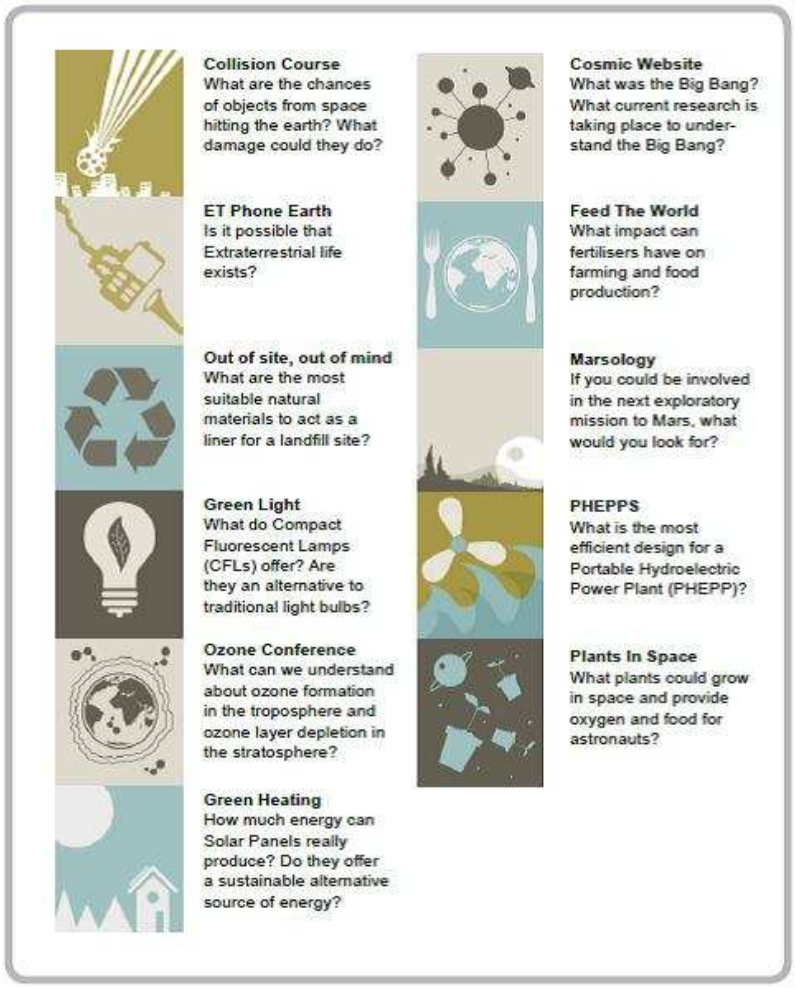
Chain Reaction: a case study



- Pupil research briefs guided their enquiries
- Supported by teachers and role model scientists

Look through the Pupil Research Brief. In what ways are the pupils being supported to act as scientists? What could work about this approach with your students (whatever age)?

Chain Reaction

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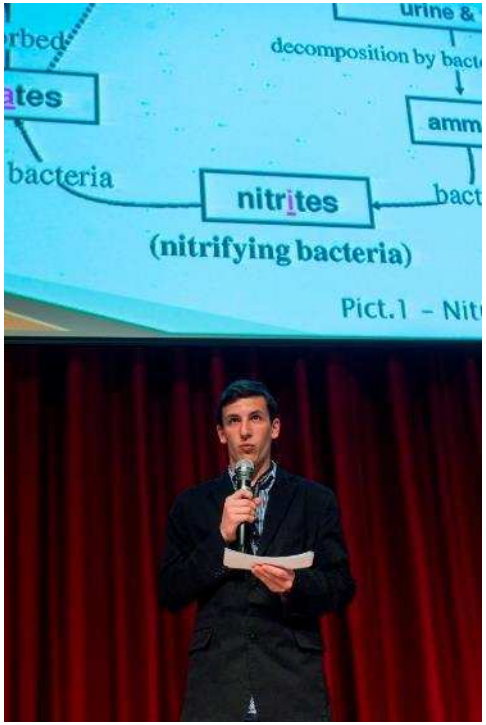
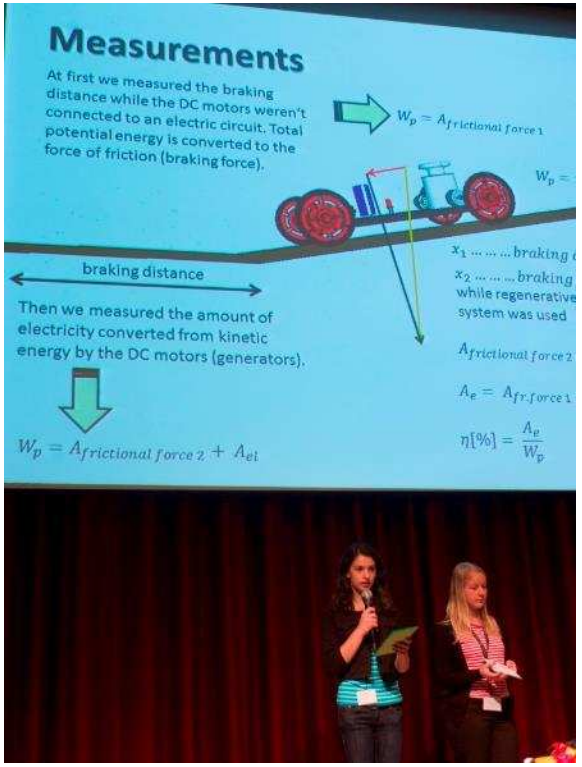
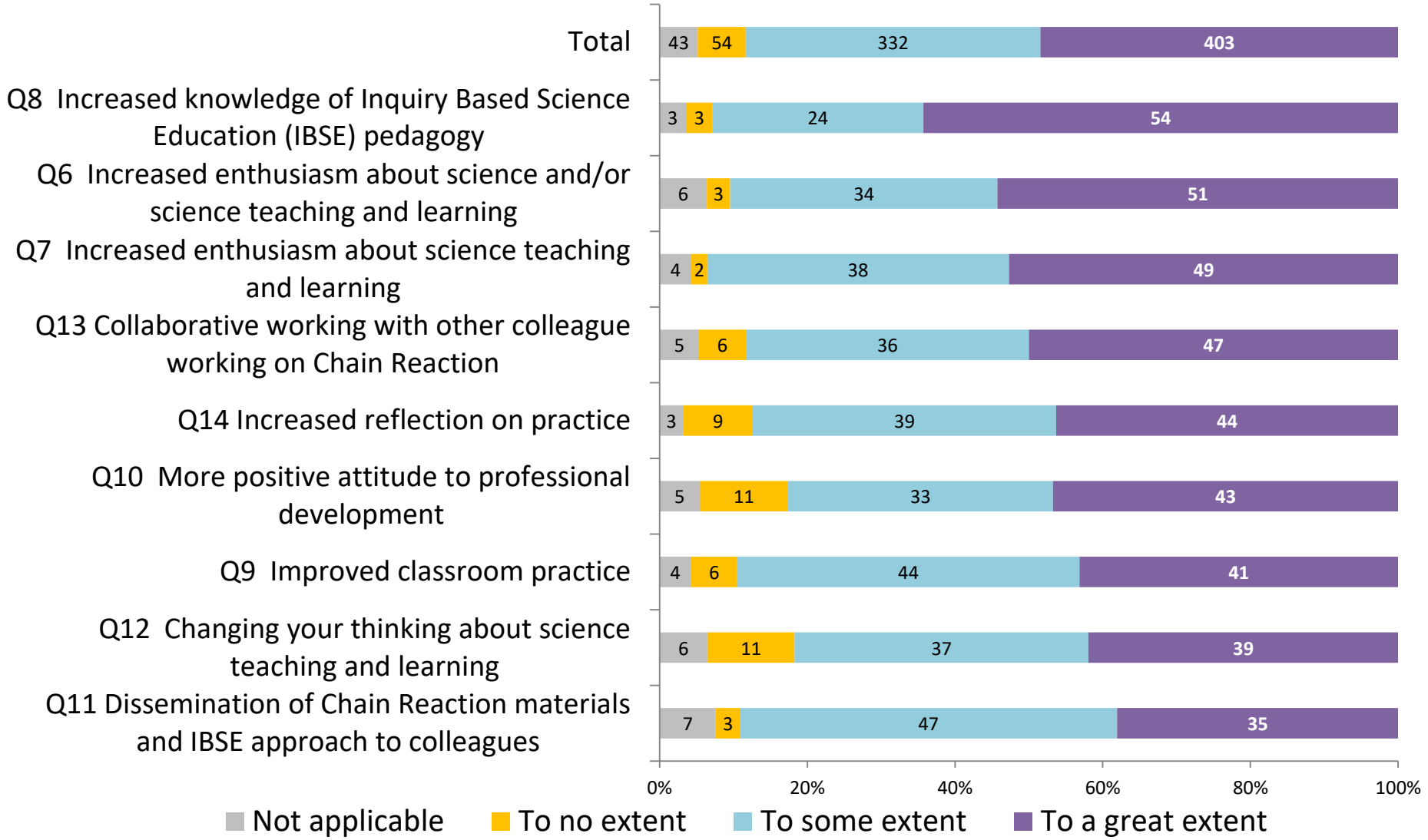
Chain Reaction: a case study

- Students presented their findings at national and international “Express Yourself” conferences
- 6,796 students, teachers and scientific role models took part in national conferences
- 756 students, teachers and role models took part in international conferences





Chain Reaction



% Teacher participants at National Conferences 2014

http://www.chreact.org.uk/pages/interviews

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Chain Reaction

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Every child a scientist: Student-centred approaches to active learning in science

Embedding our approaches worldwide

- Inspiring Science, Thailand
- Funded by British Council and BG Thailand
- Developed key teachers and Science Institute staff as expert curriculum developers.
- Teaching resources and website developed.
- Resources build scientific skills: problem-solving, communication, leadership, teamwork, thinking skills.

https://www.britishcouncil.or.th/en/programmes/education/our-work-support-basic-education/inspiring-science

Orchids

Episode 2:

Multiplying plants

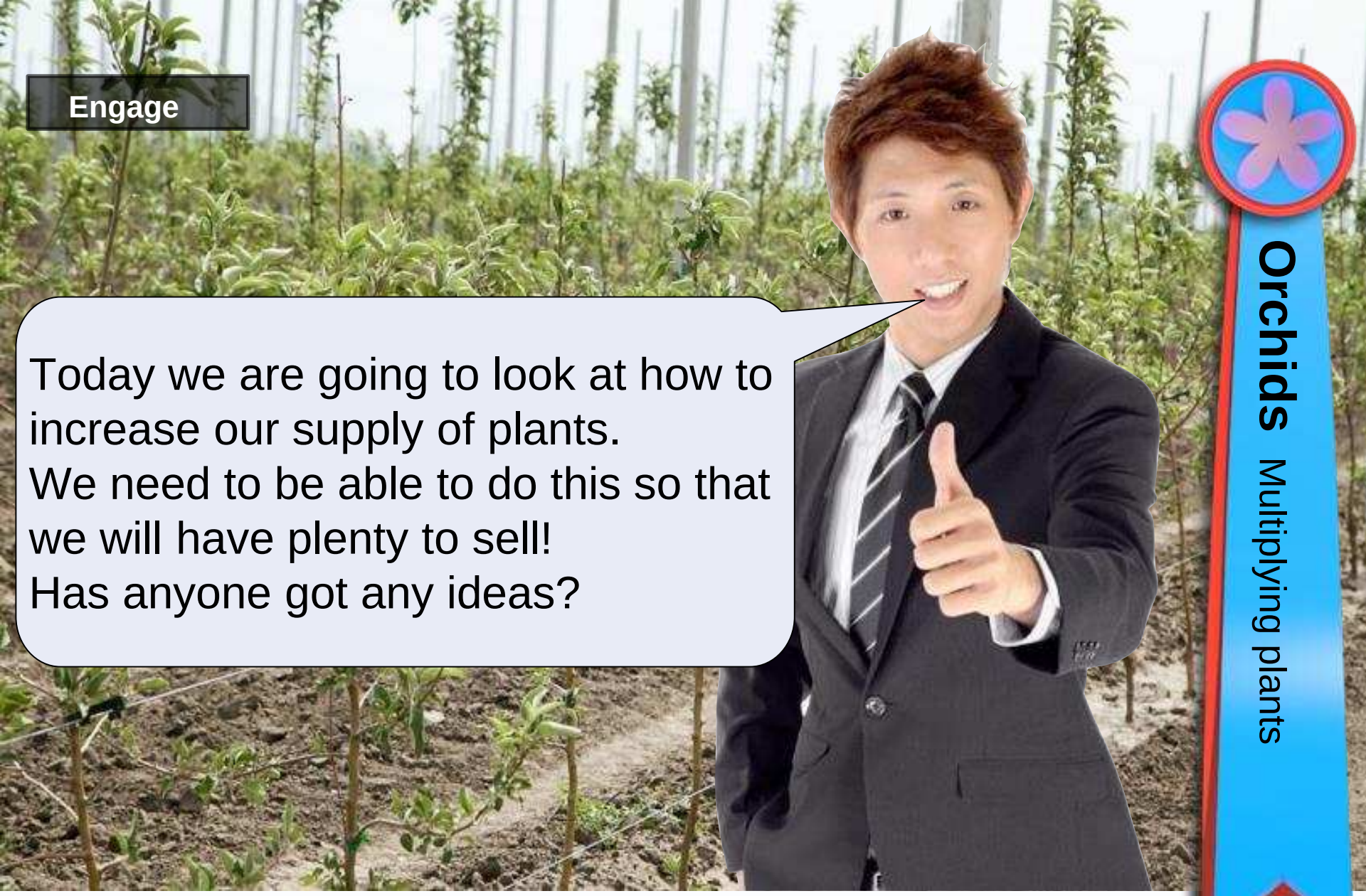
Orchids Multiplying plants

inspiring science

Objectives:

- to consider the differences between sexual and asexual reproduction
- to consider ways to multiply plants quickly
- to consider sources of contamination in tissue culture

Engage



Orchids Multiplying plants

What about growing plants from seeds?

We should just collect them from the wild. You can find loads of orchids in the rain forests.

Or taking cuttings? Can't you do that with some plants?

And I heard something about tissue culture? Don't some companies use that to make lots of orchids?

OK! Plenty to think about. I need you to do some research to find out about each of those methods. How do they work and what are the advantages and disadvantages of each to us?

Explain

I'll need a report suggesting which method we should use - and why. I'll need it in 20 minutes so you had better work in teams to gather the information you need.
Remember, you should already understand the science behind this task from your earlier work.

Orchids Multiplying plants

Contact the Inspiring Science team at

inspiring_science@hotmail.com

Sheffield Hallam University | Centre for Science Education

BRITISH COUNCIL

BG THAILAND

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Embedding our approaches worldwide

What topics for student research would work well in your contexts and countries?

- Hebat Sains - Malaysia
- Teaching Enquiry through Mysteries Incorporated (TEMI) – European Union
- Inquiry-based Science Education - Brunei
- Common Ground Curriculum for Science – International Schools worldwide

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Students acting as scientists: what are the teachers doing?

Teachers are:

- letting students plan their own learning pathways
- releasing control of the classroom
- allowing freedom and questioning
- teaching content through practical work

How can we support teachers to use these approaches in their classrooms?

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Students acting as scientists: what are the teachers doing?

Teachers need professional development which allows them to:

- trial student activities for themselves
- reflect on how best to use these resources with their own students
- understand how subject content can be taught through enquiry
- devise activities for themselves which work in their own classrooms

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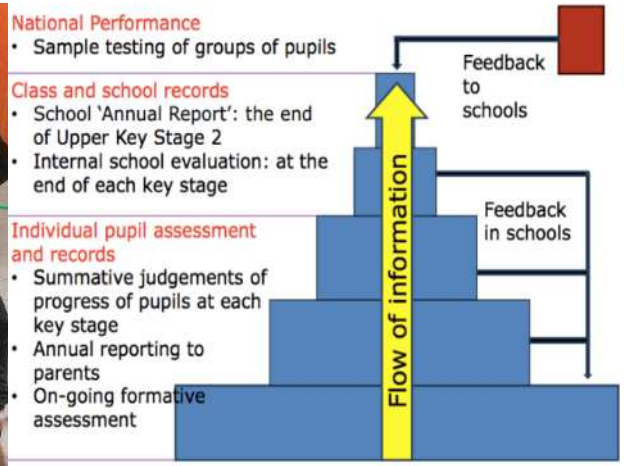
Strategies for developing questioning and lines of enquiry

Thinking and writing frames to structure investigations and collect evidence of learning

Practising peer feedback



Engaging learners through authentic and intriguing starting points

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Thank you for participating!

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